Review of the Orders of Approval
St. Croix River Basin
Maine and New Brunswick

Steering Committee Final Report

November 1997

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EXECUTIVE SUMMARY

As a result of two public meetings held in 1992 in Maine and New Brunswick by the St. Croix International Advisory Board on Pollution Control and the International St. Croix Board of Control to solicit public views and input regarding issues related to the Basin, the International Joint Commission (IJC) instructed the Boards to review the Orders of Approval regarding the regulation of Spednik and East Grand Lakes.

At a joint meeting between the two St. Croix Boards held in June 1993, a work plan was finalized for the organizational structure to execute the review of the Orders of Approval. The structure was comprised of three groups: a Steering Committee comprised of Board members that would direct the efforts for the review, a Working Group comprised of technical staff to perform the necessary analysis and a Stakeholders Group comprise of members of the various users groups and individuals in the Basin interested in the review process.

The methodology used by the Working Group to do the analysis consisted of receiveing input from the stakeholder as to their requirements, and running a computer model of the watershed to test the stakeholder input. Questionnaires throughout the basin which resulted in proposals being submitted by fourteen stakeholder groups that involved changes to discharges and lake levels in both the eastern and western branches of the St. Croix System. Each scenario suggested by the stakeholder groups was run independently, while taking into consideration the existing regulations and the structure controls.

The majority of scenarios evaluated in initial model runs experienced significant violations (not meeting a stipulated lake level or discharge). In reviewing the model output it was apparent to the Working Group that one of the most significant factors that caused violations in the analyses was a 750 cubic foot per second discharge requirement at Baring, Maine imposed by the United States Environmental Protection Agency. Since this discharge must be met year-round, the basin managers needed to utilize storage from the reservoirs during the summer periods when inflow was historically at its lowest. This conflicted with the desires of many of the stakeholders that wished to see a stable lake level during this recreational season.

The Working Group made slight modifications to an initial Stakeholder scenario and evaluated the modified scenario with the model. This modified scenario resulted in a significant decrease in the number of violations experienced even with the inclusion of additional Stakeholders requests. The Working Group reported the results of their analyses to the Steering Committee which directed the Working Group to modify Stakeholders desires and evaluate these modified scenarios to determine if a scenario without violations could be identified.

Results of the model analysis on the modified scenario indicated it was not possible to develop a scenario that was successful in all 20 years of record. The Working Group felt that any additional modifications to the proposals would not be possible without eliminating the reason the change was suggested by the Stakeholder Group.

After reviewing the Working Group final report, the Steering Committee reached the following conclusions:

- The existing Orders of Approval allow adequately for international cooperative use of the St. Croix River.
- All scenarios evaluated in the basin which included changes in the Orders of Approval and the establishment or change of other regulations experienced violations.
- The study offers no fundamental opportunities for improvement in the Orders of Approval because of the number of conflicting issues/desires presented by user interests.
- Principal user accommodations by the Georgia-Pacific Corporation have largely satisfied prevailing concerns voiced in the Basin.
- Education of Stakeholders in the management of the system and continued compromise in resolving conflicts in water use will allow the system to meet the needs of a multiple of users.
- The stakeholders in the basin were an important resource to the St. Croix Boards and although their role in the Review of the Orders is finished, their input should be encouraged in the future IJC involvement in the basin.

- Since meeting the minimum discharge requirement at Baring affects the operation of the storage reservoirs in the upper basin, before any additional work is performed examining possible changes in the Orders of Approval, the minimum discharge requirement at Baring should be reviewed by the St. Croix International Advisory Board on Pollution Control in conjunction with the United States Environmental Protection Agency and the Maine Department of Environmental Protection.

Based on the result of the investigation reviewing the Orders of Approval in the St. Croix Basin, Maine and New Brunswick, the Steering Committee makes the following recommendations to the International Joint Commission.

- The Steering Committee recommends no changes in the Orders of Approval for the St. Croix Basin.
- The Steering Committee recommends the study reviewing the Orders of Approval be concluded.
- The Steering Committee recommends a continuation of the public meetings and workshops to provide a forum for continued stakeholder input and education. The Steering Committee also recommends direct involvement by IJC Commissioners and IJC staff in future public meetings.
- No further work should be performed examining potential changes in the Orders of Approval until the need for a 750 cfs discharge at Baring is reviewed by the St. Croix International Advisory Board on Pollution Control in conjunction with the United States Environmental Protection Agency and the Maine Department of Environmental Protection.

INTRODUCTION

In the Summer of 1992, two public meetings were held by the St. Croix International Advisory Board on Pollution Control and the International St. Croix Board of Control in the St. Croix River Basin, Maine and New Brunswick. The purpose of the meetings was to solicit public views and input regarding issues related to the St. Croix Basin so that these could be reported to the International Joint Commission (IJC).

The meeting attendees expressed concern that the basin manager (Georgia-Pacific Corporation) managed the water levels and discharges strictly for its own purposes and were not sensitive to the desires and needs of other users. The public had no understanding of the reasons for fluctuations in lake levels and discharges which they felt did not favor the individual stakeholders interest. They felt that they had no mechanism to discuss issues with Georgia-Pacific and Georgia-Pacific did not attempt to accommodate other stakeholders interest. The public expressed concerns regarding timing of drawdowns, the extent of drawdown and the rate of drawdown of water levels on Spednik and East Grand Lakes, and fluctuating river flows of the St. Croix River.

Based on the information provided by the Boards, the IJC determined that it would be appropriate to review again its Order of Approval regarding the regulation of Spednik and East Grand Lakes. By a letter dated, October 1, 1992, the International Joint Commission requested that the St. Croix International Advisory Board on Pollution Control and the International St. Croix Board of Control inform the attendees of the 1992 public meeting of its decision to review the Orders of Approval and directed these Boards to jointly develop a work plan for the review of the Orders of Approval.

The purpose of the work plan was to identify the organizational structure and the methodology that would be utilized for a review of the IJC Order of Approval for Spednik and East Grand Lakes, determine if changes in that Order should be made, and identify the effects of any changes on current users and the environment. The work plan was designed to outline the evaluation strategy that should be pursued to provide sufficient information on which to make water management decisions.

ORGANIZATIONAL STRUCTURE FOR REVIEW OF ORDERS OF APPROVAL

At a joint meeting between the two St. Croix Boards held in June 1993, a work plan was finalized that identified the organizational structure to execute the review of the Orders of Approval. The organizational structure developed was comprised of three groups: a Steering Committee, a Working Group and a Stakeholders Group.

The purpose behind the formulation of these three groups was to insure, as much as possible, the participation of a wide variety of disciplines, agencies, governments, users and various interests in the review of the Orders of Approval. It was anticipated that through these various groups a full range of perspectives and concerns would be identified and included for consideration in this investigation.

Steering Committee

The Steering Committee consisted of the St. Croix International Advisory Board on Pollution Control and the International St. Croix Board of Control. It was agreed that since the review was examining potential changes in lake levels and discharges the Steering Committee would be chaired by the members of the Board of Control. The Steering Committee was to provide guidance to other groups involved in the review and was to direct all work and review and approve all products. The Steering Committee would also be responsible for preparation of a final report for submittal to the Commission with recommendations.

Working Group

The Steering Committee appointed technical staff from the agencies represented on the two Boards to be members of a Working Group. This Work Group was tasked with the day to day activities of carrying out the work plan. The Working group was also responsible for modifying and calibrating the REGUSE hydrologic model for the St. Croix River Basin. The Group was assigned to model the various scenarios proposed for modification of the existing Orders of Approval to insure that these proposal could be met. The Working Group was also responsible for developing a report documenting its efforts and making a recommendation to the Steering Committee.

Stakeholder Group

The Stakeholder Group was to comprise members of the various users groups and individuals interested in the study process. The group would provide user information, perspective and views, provide feedback, comments, advice and recommendations. The Stakeholder Group would also be a voice for affected interests including various agency concerns. It would also provide an avenue for education and two way communication with others. The Stakeholder Group and the Working Group were both directly responsible to the Steering Committee to insure independence of both groups.

EDUCATION AND OUTREACH EFFORTS

Early in the development of the work plan, the need to identify basin users and involve them in the review process was recognized. The need to educate these stakeholders about the current operational controls and constraints within the St. Croix system was also viewed as critical.

Through education the stakeholders would receive a fundamental knowledge of the operation of the basin and would learn to recognize that various stakeholders desires are in conflict. It was believed that by recognizing that conflicts exists among various groups' optimal desires, the stakeholders would see

the need for compromise. Only through some level of compromise could you insure that each group was able to utilize the resources of the St. Croix system.

Stakeholders Efforts

In order to attract and educate stakeholders,the Working Group contracted the St. Croix International Waterway Commission to advertise the first meeting of the Stakeholders Group in local newspapers and to send out information to organizations on its mailing list. The Chairmen of the Working Group presented the Work Plan at the first meeting and encouraged various stakeholders to become involved in the review of the Orders of Approval. The Working Group Chairmen explained that the Stakeholders Group were responsible for determining their organizational structure and identifying the method of accomplishing their designated tasks.

The various stakeholders were enthusiastic to become involved in the review process and quickly organized themselves for participation. The Stakeholders elected a seven member Executive Board to represent the various stakeholders throughout the investigation and communicate with the Working Group and the Steering Committee. In order to assist the Stakeholders Group, the Working Group provided approximately $2,400 in US funds to organize and finance some Stakeholders Group activities.

After the organization and development of the Stakeholders Group, members of the group contacted other organizations that weren't represented at the initial meeting and encouraged them to join the Stakeholders Group. Members of the Executive Board made five presentations on water management operations and their proposed activities at general meetings throughout the basin to educate and encourage participation in the review process.

In June 1994, the Stakeholders Group distributed questionnaires to the various users groups throughout the basin and made the questionnaires available to the general public. The purpose of these questionnaires was to identify additional stakeholders who wanted to participate in the review, to determine stakeholders views on the current operation of the St. Croix River system and to solicit suggestions on potential changes in operation of the system. The suggestions that were submitted as a result of the questionnaire were reviewed by the Executive Board of the Stakeholders Group and were given to the Working Group to be evaluated utilizing a hydrologic model.

Although the amount of participation by various stakeholder groups varied throughout the study, the Stakeholder Group established a good communication network among the various users. The user groups also became involved in discussions with Georgia-Pacific on opportunities for various adjustments in lake levels or discharges to meet desires or recreational and commercial opportunities of the users.

Basin Manager Efforts

Prior to the review of the Orders of Approval, Georgia-Pacific, attended but did not really participate in public meetings held by the St. Croix Boards. After the work plan was developed, the Steering Committee held a public meeting to present the work plan and solicit comments. At that public meeting the hydropower manager of G-P in the St. Croix made a presentation on the characteristics of the basin, the various regulatory controls and "soft" agreements in the basin and how the basin was operated.

The presentation was well received and many stakeholders commented that they were unaware of all the factors and constraints that must be considered when operating the waterway to balance commercial, recreational, hydropower, municipal treatment facilities, water quality and fisheries interests. The G-P

hydropower manager has given his presentation on the considerations and operations of the basin at all public meetings held by the St. Croix Boards as well as the five presentations by the Stakeholders Group.

The presentations not only educated the stakeholders and the public on the reasons and method of managing the waterway they exposed the conflicts in meeting different groups desires. They also allowed them to talk to an individual instead of a "faceless" corporation. The G-P manager encouraged groups to contact him to discuss changes in operations to meet user needs for events. G-P established a telephone line where groups could call and find out changes in the operation of the system.

Public Meetings

The review of Orders of Approval was initiated due to comments received by the St. Croix Boards at a public meeting held in the basin in 1992. The Boards utilized public meetings as an opportunity to inform the public of the status of the review, to receive input from organizations and individual citizens with both upper basin and estuary concerns. This input was helpful in the review of the orders and for the Boards to provide timely information to the IJC to keep the Commission aware of basin concerns.

The St. Croix Boards are continuing annual public meetings in the basin and attempting to coordinate these meetings so that they are held when the majority of interests are in the basin and when IJC commissioners can attend. Similar to the situation with G-P, having IJC commissioners present gives the public an opportunity to talk directly to the IJC and insure that their concerns and issues are heard first hand.

REGUSE MODEL

In order to evaluate the proposed scenarios suggested by the Stakeholders Group, the Working Group utilized a hydrologic model, called REGUSE. The REGUSE model was developed beginning in 1990, by Environment Canada and the St. Croix International Waterway Commission in the St. Croix Reservoir Regulation Study as a tool for analyzing water regulation of the St. Croix River Basin. The REGUSE model has evolved as an efficient water management tool to assist river basin managers in allocating available water resources. It can generate an optimal basin-wide solution in order to meet a user defined set of objectives and priorities. This model provides features like the ability to represent the ecosystem by integrating each individual requirement in the form of water levels and discharges. The flexibility of this model makes it an excellent tool for many study applications, which include planning scenarios, conflict resolution, additional reservoir assessments and real time operation and forecasting.

A large and complex watershed like the St. Croix River includes a variety of water users including hydroelectric generating companies, municipalities, agricultural and other industries, native groups, recreational interests, outfitters, cottage owners, and proponents of waterfowl and fish habitats, all of whom can have conflicting lake and channel level requirements. The ability to represent all user demands from stakeholders on 7 reservoirs and 7 channels through the use of a mathematical computer model allowed the Working Group to understand how the system reacts to an increasing demand and a limited resource. The need to identify and consider simultaneously several objectives in the analysis and solution of a multiple purpose, multiple reservoir watershed demonstrated the need to use a mathematical conflict resolution method.

Model Description

The REGUSE model has three main features that make it unique among current water management

models. First, the solution is generated from the simultaneous solutions of all unit-time periods within a time horizon rather than a unique solution for each unit-time period (Environment Canada, 1989). This reflects the reality of water management, where often historical data is used as a proxy for forecast data. Therefore, the modelled step must be limited to a period for which forecast data would have been available. Second, the simultaneous solution allows the introduction of channel routing and actual travel to be considered by the model. Third, the use of multiple rating curves to represent existing control structure openings forces the model to closely match the actual operation of the structures and power dams within the river system.

The network flow approach used by the REGUSE model makes it ideal for basin management applications. The Link path connecting the reservoirs in the basin can be assigned an upper and lower flow or level bounds, which relate directly to the flow and storage capacities of the real reservoir and the river systems of the watershed. All flow and level values are automatically converted by the model into the proposed unit-time period suggested by the user. Any departure from the calculated flow and storage conditions in the basin is penalized by imposing penalty coefficients on the flow in each channel and reservoir. Such penalty coefficients are chosen to reflect the operating priorities of the basin under varying hydrologic or user defined conditions.

INITIAL EVALUATION OF STAKEHOLDERS GROUP'S PROPOSED CHANGES

General

As mentioned earlier, the Stakeholders Group submitted suggested changes in the operation of the St. Croix River System as a result of response from questionnaires submitted by various Stakeholder Organizations. Proposals were submitted by fourteen stakeholder groups and involved changes to discharges and lake levels in both the eastern and western branches of the St. Croix System.

The REGUSE model utilizes a penalty coefficient system that priorities the lake levels or discharges that must be considered in managing the river system. Lake levels and discharges established in IJC Orders of Approval or Regulatory agencies were given the highest penalties. The Working Group recognized that requirements by regulatory agencies needed a high penalty coefficient because these requirements could not be changed by the IJC and could effect the ability of the IJC to consider modification of its own Orders of Approval. The penalties for lake levels and discharges under existing agreements between agencies, cottage owners, etc. were given the next highest penalties. The final penalties were established for the lake levels or discharges proposed by the stakeholders for analysis. The model will automatically made the required adjustments to meet the lake levels or discharges input in descending order from the highest penalties to the lowest. Anytime that a stipulated lake level or discharge is not met, the model will record that instance as a "violation" of the management scenario being analyzed.

A meeting was held between members of the stakeholder groups making recommendations for changes and members of the Working Group for a spokesperson from each group to explain the rationale for their proposed changes to the modelling staff of the Working Group. This information would allow the Working Group to develop the penalty coefficients for the model analysis. It would also ensure that, if adjustments to the proposal were made in later model analyses, the purpose of the proposed changes would not be severely impacted.

Because of the multiple reservoirs on the St. Croix River Basin, and because no priority was established by the Stakeholders Group on any proposed modification, the Working Group determined that a necessary first step was to provide separate modelling results for each proposal. Each scenario suggested by the stakeholder groups was run independently, while taking into consideration the existing

regulations and the structure controls. This insured that the proposed change was evaluated without any possible interference from other suggested changes to the same lake or reach of river from another stakeholder group. This has allowed the Working Group to verify if meeting the stakeholders' desires were possible or not; and, if not, to determine the reasons for failing to do so. Since each interest group's request was modelled separately, conflicting water use would not be an issue. Any violations which occurred would be related to the quantity of water. Either there was too much water to be controlled by the structure in order to meet the proposals, or there was a lack of water either in the reservoirs or in the rivers to meet the desired levels proposed. The initial proposals that were not successful at this phase would not be successful in modelling multiple uses. Identifying such proposals and the reasons they were not successful allowed the Working Group to make informed modifications to each proposal.

The Working Group established that in order for a proposed scenario to be considered successful as a potential change in the existing Orders of Approval, the scenario could not experience any violations in the twenty year period of analysis evaluated by the REGUSE model, particularly of restrictions/regulations that could not be modified by the IJC. Violations occurred when the water level exceeded proposed levels, did not attain proposed minimum level, or minimum discharges were not satisfied. It was also determined that detailed output of each scenario would be examined in detail, even if it did not experience violations, to determine if it had a potential detrimental effect of other Stakeholders desires.

Summary of Initial Model Evaluation of Stakeholders Proposed Modifications

The majority of scenarios evaluated in initial REGUSE model runs experienced significant violations. In three scenarios, violations were not experienced but the Working Group determined those scenarios unacceptable after review of the model output. In all three of those cases, the scenario which called for an increase in river discharge was only successful by massive drawdowns of lake levels. It was complaints regarding the drawdown of East Grand and Spednik Lake that caused the International Joint Commission to initiate the review of existing Orders of Approval. For this reason, the Working Group felt it was impractical to consider drawdowns more significant than had been experienced is recent years as something that would be acceptable by stakeholders utilizing the lake system.

In reviewing the model output it was apparent to the Working Group that one of the most significant factors that caused violations in the analyses was the USEPA 750 cfs discharge requirement at Baring, Maine. Since this discharge must be met year-round, the basin managers needed to utilize storage from the reservoirs during the summer periods when inflow was historically at its lowest. This conflicted with the desires of many of the stakeholders that wished to see a stable lake level during this recreational season.

Working Group Modified Proposal

The initial scenarios proposed by the various Stakeholders groups could not be achieved without violations and it appeared that it would be difficult for the Stakeholders Executive Board to get concessions from various stakeholders to modify their desires in the management of the St. Croix system. With time and available resources dwindling, the Working Group decided to make slight modifications to an initial Stakeholder scenario and evaluate the working group modified scenario with the model. This could give an indication if, by adjusting Stakeholder optimum desires, feasible changes could be accommodated that would result in an improvement for all Stakeholders utilizing the St Croix system.

The Working Group selected East Grand Lake for the modified scenario for analysis. This was due to

the fact that significant violations occurred in the initial modelling evaluation at this facility. The Working Group incorporated the existing regulations related to East Grand from the IJC and the letter of agreement with the State of Maine. The existing operating levels of Georgia-Pacific Corporation as well as a proposal for change by G-P and a proposal by the North Lake Local Service District Advisory Committee were incorporated. Finally, the proposed levels requested by Chiputneticook Lakes International Conservancy were slightly modified and included in the model evaluation.

This modified scenario resulted in a significant decrease in the number of violations at East Grand Lake even with the inclusion of other Stakeholders requests. The significant decrease in violations experienced with only slight modifications of Stakeholders proposals indicated to the Working Group that it might be possible to identify scenarios that Georgia-Pacific Corporation could accommodate without violations yet could improve Stakeholders experiences in the St. Croix Basin.

The Working Group reported the results of their analyses to the Steering Committee and requested that they be allowed to modify Stakeholders desires and evaluate these modified scenarios Although all resources devoted to the modelling effort had been exhausted, the Working Group requested permission to transfer IJC provided resources intended for report documentation to the additional modelling analysis.

The Steering Committee reported the Working Group preliminary findings to the International Joint Commission at the April 1995 Semi-Annual meeting and requested permission for the transfer of IJC funds to continue modelling efforts examining modified scenarios. The Steering Committee indicated to the IJC that it concurred with the Working Group's belief that by modifying the Stakeholders optimal conditions, it might be possible to improve the operation of the St. Croix system to accommodate Stakeholders desires without imposing restrictions on Georgia-Pacific Corporation that would cause violations of Orders of Approval. The International Joint Commission agreed to the Steering Committee's request and authorized the transfer of funds.

EVALUATION OF MODIFIED STAKEHOLDER'S GROUPS PROPOSED CHANGES

General

The intent of the final model analysis was to review the desires of the various stakeholders and to develop a combined scenario of regulation of the St. Croix Basin to allow for the lake levels and discharges that would better meet the needs of the various users of the system. Earlier model work had concluded that the optimum conditions identified by the various stakeholders could not be attained in all hydrologic years of analysis. The Working Group believed that it was possible to modify the initial input of the stakeholders to develop a scenario that would balance the various stakeholders interests that were often in conflict.

In developing the modified scenario the Working Group recognized the reason for modifications suggested by various stakeholder groups when adjusting the levels and discharges. It was agreed that modifications would not be made that eliminated the reason for the change suggested by the stakeholders. For example, a stakeholder group had suggested a maximum lake level for East Grand lake during the recreation season to insure that beaches would be exposed for use by the Basin users. Modifications proposed by the Working Group would consider this use and insure that the intent of the proposed modification was maintained.

The modified scenario tried to establish a complete set of stakeholder desires that would be able to function together within this watershed. This scenario was developed with these desires viewed as equal,

so that all of the proposals were of equal water related importance. It was determined that this scenario was not intended to provide levels or other controls that will become regulations but rather will concentrate on providing a combination of proposals that could function together.

Results of Modified Scenario Modelling Efforts

It was not possible to develop a scenario that was successful in all 20 years of record. However the Working Group did identify operating controls which could be attained for 19 years out of the 20 of record from 1970 to 1989. Only 1985, the driest year of record showed violations.

CONCLUSION

The purpose of this investigation was to examine the existing Orders of Approval that have been approved by the International Joint Commission for various facilities in the St. Croix River System and determine if changes were warranted.

The current operating controls for the seven reservoirs and seven dams in the St. Croix watershed were found to be attainable and did not prove to be problematic for Georgia-Pacific in the 20 years studied. The modeiling results show that if the current agreements with some Stakeholders, such as were to be considered as regulations the current regulations would often be in conflict with these requirements. The review results also show that the current agreements with stakeholders were followed when possible and that Georgia-Pacific has improved water level and discharge management which does increase the recreational activities in the waterways of this watershed.

Early modelling efforts by the Working Group utilized the proposed modifications developed by the Stakeholders Group. Each Stakeholder's suggested modification was modelled separately to determine if the modification could have been accommodated in the twenty year period of analysis. Modelling the modification separately allowed for a determination of potential success without interference from other modifications proposed by other users. The result of initial model runs indicated that the proposed scenarios with the optimum conditions identified by the various stakeholders could not be attained in all hydrologic years of analysis without violations of the proposals or without undesirable effects such as massive drawdown in reservoirs in the middle of the recreation season.

The Working Group believed that it was possible to modify the initial input of the stakeholders to develop a scenario that would balance the various stakeholders interests that were often in conflict. The Working Group proposed an analysis where it would review the desires of the various stakeholders and by modifying initial stakeholders desires develop a combined scenario of control to allow for lake levels and discharges that would better meet the needs of the various users of the system.

The results of initial model runs utilizing optimum conditions identified by the various stakeholders caused violations and undesirable effects such as massive drawdown of lake levels during the recreational season to meet discharge requirements.

It was not possible to develop a scenario that was successful in all 20 years of record. However the Working Group did identify operating controls which could be attained for 19 years out of the 20 of record. The Working Group felt that any additional modifications to the proposals would not be possible without eliminating the reason the change was suggested by the Stakeholder Group.

It was apparent early in the investigation that one of the most significant reasons for failure of being able to accommodate the changes in lake levels and discharges requested by Stakeholder Groups or in the

modified, combined scenario proposed by the Working Group was the minimum 750 cfs discharge requirement at Baring (below Woodland Dam) set by the United States Environmental Protection Agency. This minimum discharge was established in the late 1970's after modelling work performed by the USEPA.

Although changes have occurred in the operation of the Woodland facility that could cause USEPA to review this minimum requirement, the State of Maine did indicate that it believes that an increase in minimum discharge might be preferred at Baring for fishery considerations. Since this discharge requirement is not set by the International Joint Commission and not subject to change by that organization, no attempts were made to model the basin with a change in this requirement.

Aside from its technical aspects and the practical application of hydrology on which the model rests, the REGUSE model also allows stakeholders to articulate their needs relative to the water resource. This articulation in itself can contribute to conflict resolution and to understanding the needs of others. The final modified scenario provides the stakeholders with a starting point for discussion as stakeholders. While the individual stakeholder proposals could be interpreted as an initial bargaining, the scenario that provides a compromise solution offered in this report should be viewed as perhaps what is more realistically attainable by those seeking multiple beneficial uses of the watershed.

The education and communication that developed between the stakeholders and the basin manager was a positive experience and a foundation for further education, discussions and management efforts. The willingness of the basin manager to meet with stakeholder groups to try and resolve the water use conflicts enhanced the education, communication and development of cooperation between all parties. This initiative and the continued support of the various stakeholders show a level of participation that should continue in the future.

After a detailed investigation, the Steering Committee has reached the following conclusions:

- The existing Orders of Approval allow adequately for international cooperative use of the St. Croix River.
- All scenarios evaluated in the basin which included changes in the Orders of Approval and the establishment or change of other regulations experienced violations.
- The study offers no fundamental opportunities for improvement in the Orders of Approval because of the number of conflicting issues/desires presented by user interests.
- Principal user accommodations by the Georgia-Pacific Corporation have largely satisfied prevailing concerns voiced in the Basin.
- Education of Stakeholders in the management of the system and continued compromise in resolving conflicts in water use will allow the system to meet the needs of a multiple of users.
- The stakeholders in the basin were an important resource to the St. Croix Boards and although their role in the Review of the Orders is finished, their input should be encouraged in the future IJC involvement in the basin.
- Since meeting the minimum discharge requirement at Baring affects the operation of the storage reservoirs in the upper basin, before any additional work is performed examining possible changes in the Orders of Approval, the minimum discharge requirement at Baring should be reviewed by the St. Croix International Advisory Board on Pollution Control in conjunction with the United States Environmental Protection Agency and the Maine Department of Environmental Protection.

RECOMMENDATIONS

Based on the result of the investigation reviewing the Orders of Approval in the St. Croix Basin, Maine

and New Brunswick, the Steering Committee makes the following recommendations to the International Joint Commission.

- The Steering Committee recommends no changes in the Orders of Approval for the St. Croix Basin.
- The Steering Committee recommends the study reviewing the Orders of Approval be concluded.
- The Steering Committee recommends a continuation of the public meetings and workshops to provide a forum for continued stakeholder input and education. The Steering Committee also recommends direct involvement by IJC Commissioners and IJC staff in future public meetings.
- No further work should be performed examining potential changes in the Orders of Approval until the need for a 750 cfs discharge at Baring is reviewed by the St. Croix International Advisory Board on Pollution Control in conjunction with the United States Environmental Protection Agency and the Maine Department of Environmental Protection.

Respectfully submitted for the St. Croix Steering Committee,

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